Dynamic and hybrid materials. Properties and applications

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Dynamic systems that can undergo reversible processes are of great interest for the development of new materials, sensors, biolabels…. The talk will illustrate some of the recent results on soft structures based on metal complexes able to aggregate in fibers, gels and soft mechanochromic materials [1]. The use of platinum complexes as building block for luminescent reversible piezochromic and mechanochromic materials will be illustrated. The emission of the compounds can be tuned by an appropriate choice of the coordinated ligands as well as of their aggregation in different structures. The formation of soft assemblies allows the tuning of the emission color, by pressure and temperature leading to a new class of materials possessing reversible properties.

Functional systems can also be created using inert or active inorganic nanocontainers such as microporous and mesoporous silica based nanoparticles. In particular examples using the crystalline allumino silicates, zeolite L, and mesoporous organosilicates will be discussed since these materials can act as nanocontainers and due to their biocompatibility used for biomedical applications. The different functionalization of their surface will be discussed, in particular with the aim to show that the particles can be decorated with different functional groups including biocompatible molecules and are able to perfom drug and PNA delivery inside the cell [2,3]. The delivery can be probed by kinetic analyses after the nanoparticles internalization. In particular using confocal fluorescent microscopy it is possible to follow the release of each single component as well as the positioning of the nanocontainers in real time and space. Such achievement allows us to study the fate of the different units and their release time. However as many nanoparticles they are not biodegradable. Therefore at the end of the contribution very recent advances aiming to the creation of stimulus responsive particles that can break in vivo will be illustrated [4].

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References

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